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<110> Lockridge, Oksana  
Watkins, Jeffry D.

<120> Butyrylcholinesterase Variants and  
Methods of Use

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<141> 2000-12-06

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<221> CDS

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Trp Asn Ala Thr Lys Tyr Ala Asn Ser Cys Cys Gln Asn Ile Asp Gln  
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Val Glu Arg Val Ile Val Val Ser Met Asn Tyr Arg Val Gly Ala Leu	
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 Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80  
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 115 120 125  
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109430-030101

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Trp	Val	Gln	Lys	Asn	Ile	Ala	Ala	Phe	Gly	Gly	Asn	Pro	Lys	Ser	Val
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Glu	Thr	Glu	Ile	Ile	Lys	Cys	Leu	Arg	Asn	Lys	Asp	Pro	Gln	Glu	Ile
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Pro	Ala	Leu	Glu	Phe	Thr	Lys	Lys	Phe	Ser	Glu	Trp	Gly	Asn	Asn	Ala
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Phe	Phe	Tyr	Tyr	Phe	Glu	His	Arg	Ser	Ser	Lys	Leu	Pro	Trp	Pro	Glu
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Pro	Leu	Glu	Arg	Arg	Asp	Asn	Tyr	Thr	Lys	Ala	Glu	Glu	Ile	Leu	Ser
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Val	Glu	Arg	Val	Ile	Val	Val	Ser	Met	Asn	Tyr	Arg	Val	Gly	Ala	Leu	
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Gly	Ala	Ala	Ser	Val	Ser	Leu	His	Leu	Leu	Ser	Pro	Gly	Ser	His	Ser	
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Leu	Phe	Thr	Arg	Ala	Ile	Leu	Gln	Ser	Gly	Ser	Phe	Asn	Ala	Pro	Trp	
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Ala	Val	Thr	Ser	Leu	Tyr	Glu	Ala	Arg	Asn	Arg	Thr	Leu	Asn	Leu	Ala	
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Phe	Lys	Lys	Thr	Gln	Ile	Leu	Val	Gly	Val	Asn	Lys	Asp	Glu	Gly	Thr	
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Ala	Phe	Leu	Val	Tyr	Gly	Ala	Pro	Gly	Phe	Ser	Lys	Asp	Asn	Asn	Ser	
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Trp Val Asp Asp Gln Arg Pro Glu Asn Tyr Arg Glu Ala Leu Gly Asp			
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Lys Phe Ser Glu Trp Gly Asn Asn Ala Phe Phe Tyr Tyr Phe Glu His			
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Tyr Glu Ile Glu Phe Val Phe Gly Leu Pro Leu Glu Arg Arg Asp Asn			
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Thr Ser Trp Pro Val Phe Lys Ser Thr Glu Gln Lys Tyr Leu Thr Leu			
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Arg Phe Trp Thr Ser Phe Phe Pro Lys Val Leu Glu Met Thr Gly Asn			
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Ile Asp Glu Ala Glu Trp Glu Trp Lys Ala Gly Phe His Arg Trp Asn			
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Tyr	Ala	Gln	Pro	Pro	Leu	Gly	Arg 40	Leu	Arg	Phe	Lys	Lys 45	Pro	Gln	Ser
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Thr	Leu	Phe 195	Gly	Glu	Ser	Ala	Gly 200	Ala	Ala	Ser	Val	Ser 205	Leu	His	Leu
Leu	Ser 210	Pro	Gly	Ser	His	Ser 215	Leu	Phe	Thr	Arg	Ala 220	Ile	Leu	Gln	Ser
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Phe	Phe	Tyr	Tyr	Phe	Glu	His	Arg	Ser	Ser	Lys	Leu	Pro	Trp	Pro	Glu	420	425	430
Trp	Met	Gly	Val	Met	His	Gly	Tyr	Glu	Ile	Glu	Phe	Val	Phe	Gly	Leu	435	440	445
Pro	Leu	Glu	Arg	Arg	Asp	Asn	Tyr	Thr	Lys	Ala	Glu	Glu	Ile	Leu	Ser	450	455	460
Arg	Ser	Ile	Val	Lys	Arg	Trp	Ala	Asn	Phe	Ala	Lys	Tyr	Gly	Asn	Pro	465	470	475
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Glu	Gln	Lys	Tyr	Leu	Thr	Leu	Asn	Thr	Glu	Ser	Thr	Arg	Ile	Met	Thr	500	505	510
Lys	Leu	Arg	Ala	Gln	Gln	Cys	Arg	Phe	Trp	Thr	Ser	Phe	Phe	Pro	Lys	515	520	525
Val	Leu	Glu	Met	Thr	Gly	Asn	Ile	Asp	Glu	Ala	Glu	Trp	Glu	Trp	Lys	530	535	540
Ala	Gly	Phe	His	Arg	Trp	Asn	Asn	Tyr	Met	Met	Asp	Trp	Lys	Asn	Gln	545	550	555
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CCDS:CCDS100.1

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Glu Asp Asp Ile Ile Ile Ala  
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Trp Asn Ala Thr Lys Tyr Ala Asn Ser Cys Cys Gln Asn Ile Asp Gln  
60 65 70

agt ttt cca ggc ttc cat gga tca gag atg tgg aac cca aac act gac 474  
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Leu Ser Glu Asp Cys Leu Tyr Leu Asn Val Trp Ile Pro Ala Pro Lys  
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235			240			245										
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380			385			390										

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Asn Tyr Met Met Asp Trp Lys Asn Gln Phe Asn Asp Tyr Thr Ser Lys	
555 560 565	
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Lys Glu Ser Cys Val Gly Leu	
570	

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tattatgtag ctgaaacaaa aatgccagaa ggataatatt	gattcctcac atctttaact	2085
tagtatttta cctagcattt caaaacccaa atggctagaa	catgtttaat taaatttcac	2145
aatataaagt tctacagtta attatgtgca tattaaaaca	atggcctggg tcaatttcct	2205
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Val	Asn	Lys	Asp	Glu	Gly	Thr	Ala	Phe	Leu	Val	Tyr	Gly	Ala	Pro	Gly
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Phe	Ser	Lys	Asp	Asn	Asn	Ser	Ile	Ile	Thr	Arg	Lys	Glu	Phe	Gln	Glu
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Ile	Leu	Phe	His	Tyr	Thr	Asp	Trp	Val	Asp	Asp	Gln	Arg	Pro	Glu	Asn
	370					375					380				
Tyr	Arg	Glu	Ala	Leu	Gly	Asp	Val	Val	Gly	Asp	Tyr	Asn	Phe	Ile	Cys
385					390					395					400
Pro	Ala	Leu	Glu	Phe	Thr	Lys	Lys	Phe	Ser	Glu	Trp	Gly	Asn	Asn	Ala
				405					410					415	
Phe	Phe	Tyr	Tyr	Phe	Glu	His	Arg	Ser	Ser	Lys	Leu	Pro	Trp	Pro	Glu
			420					425					430		
Trp	Met	Gly	Val	Met	His	Gly	Tyr	Glu	Ile	Glu	Phe	Val	Phe	Gly	Leu
	435					440						445			
Pro	Leu	Glu	Arg	Arg	Asp	Asn	Tyr	Thr	Lys	Ala	Glu	Glu	Ile	Leu	Ser
	450					455					460				
Arg	Ser	Ile	Val	Lys	Arg	Trp	Ala	Asn	Phe	Ala	Lys	Tyr	Gly	Asn	Pro
465					470					475					480
Asn	Glu	Thr	Gln	Asn	Asn	Ser	Thr	Ser	Trp	Pro	Val	Phe	Lys	Ser	Thr
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Glu	Gln	Lys	Tyr	Leu	Thr	Leu	Asn	Thr	Glu	Ser	Thr	Arg	Ile	Met	Thr
			500					505					510		
Lys	Leu	Arg	Ala	Gln	Gln	Cys	Arg	Phe	Trp	Thr	Ser	Phe	Phe	Pro	Lys
		515					520					525			
Val	Leu	Glu	Met	Thr	Gly	Asn	Ile	Asp	Glu	Ala	Glu	Trp	Glu	Trp	Lys
	530					535					540				
Ala	Gly	Phe	His	Arg	Trp	Asn	Asn	Tyr	Met	Met	Asp	Trp	Lys	Asn	Gln
545					550					555					560
Phe	Asn	Asp	Tyr	Thr	Ser	Lys	Lys	Glu	Ser	Cys	Val	Gly	Leu		
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<211> 15

<212> PRT

<213> Artificial Sequence

<220>

<223> Human Butyrylcholinesterase variant

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<212> PRT

<213> Artificial Sequence

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<223> Human Butyrylcholinesterase variant

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<210> 11

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<212> PRT

<213> Artificial Sequence

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<210> 12

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<212> PRT

<213> Artificial Sequence

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<223> Human Butyrylcholinesterase variant

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Ser Gly Ser Phe Asn Ala Pro Trp Ala Val Thr  
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<223> Human Butyrylcholinesterase variant

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Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val Asn  
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<210> 14

<211> 6

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<213> Artificial Sequence

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<223> Human Butyrylcholinesterase variant

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Thr Ala Phe Leu Val Tyr  
1 5

<210> 15  
<211> 14  
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<220>  
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<400> 15  
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aatggaaaag tcagagggat gaacttgaca gtttttggtg gcacggtaac agccttctct 300  
ggaattccct atgcacagcc acctcttggt agacttcgat tcaaaaagcc acagtctctg 360  
accaagtggg ctgatatttg gaatgccaca aaatatgcaa attcttgctg tcagaacata 420  
gatcaaagtt ttccaggctt ccattggatca gagatgtgga acccaaacac tgacctcagt 480  
gaagactggt tatatctaaa tgtatggatt ccagcaccta aacccaaaaa tgccactgta 540  
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ggcaagtttc tggctcgggt tgaaagagtt attgtagtgt caatgaacta taggggtgggt 660  
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ctggaaagaa gagataatta cacaaaagcc gaggaaattt tgagtagatc catagtgaag 1620  
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<212> PRT
<213> Homo sapiens
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Asn	Leu	Thr	Val 20	Phe	Gly	Gly	Thr	Val 25	Thr	Ala	Phe	Leu	Gly 30	Ile	Pro
Tyr	Ala	Gln	Pro	Pro	Leu	Gly	Arg 40	Leu	Arg	Phe	Lys	Lys 45	Pro	Gln	Ser
Leu	Thr 50	Lys	Trp	Ser	Asp	Ile 55	Trp	Asn	Ala	Thr	Lys 60	Tyr	Ala	Asn	Ser
Cys 65	Cys	Gln	Asn	Ile	Asp 70	Gln	Ser	Phe	Pro	Gly 75	Phe	His	Gly	Ser 80	Glu
Met	Trp	Asn	Pro	Asn 85	Thr	Asp	Leu	Ser	Glu 90	Asp	Cys	Leu	Tyr	Leu 95	Asn
Val	Trp	Ile	Pro 100	Ala	Pro	Lys	Pro	Lys 105	Asn	Ala	Thr	Val	Leu 110	Ile	Trp
Ile	Tyr	Gly 115	Gly	Gly	Phe	Gln	Thr 120	Gly	Thr	Ser	Ser	Leu 125	His	Val	Tyr
Asp	Gly 130	Lys	Phe	Leu	Ala	Arg 135	Val	Glu	Arg	Val	Ile 140	Val	Val	Ser	Met
Asn 145	Tyr	Arg	Val	Gly	Ala 150	Leu	Gly	Phe	Leu	Ala 155	Leu	Pro	Gly	Asn 160	Pro
Glu	Ala	Pro	Gly	Asn 165	Met	Gly	Leu	Phe	Asp 170	Gln	Gln	Leu	Ala 175	Leu	Gln
Trp	Val	Gln 180	Lys	Asn	Ile	Ala	Ala 185	Phe	Gly	Gly	Asn 190	Pro	Lys	Ser	Val
Thr	Leu	Phe 195	Gly	Glu	Ser	Ala	Gly 200	Ala	Ala	Ser	Val 205	Ser	Leu	His	Leu
Leu	Ser 210	Pro	Gly	Ser	His	Ser 215	Leu	Phe	Thr	Arg	Ala 220	Ile	Leu	Gln	Ser
Gly 225	Ser	Phe	Asn	Ala	Pro 230	Trp	Ala	Val	Thr	Ser 235	Leu	Tyr	Glu	Ala 240	Arg
Asn	Arg	Thr	Leu	Asn 245	Leu	Ala	Lys	Leu	Thr 250	Gly	Cys	Ser	Arg	Glu 255	Asn
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<210> 18
<211> 574
<212> PRT
<213> Homo sapiens
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**<400> 18**

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			20					25					30		
Tyr	Ala	Gln	Pro	Pro	Leu	Gly	Arg	Leu	Arg	Phe	Lys	Lys	Pro	Gln	Ser
		35					40					45			



Leu	Thr	Lys	Trp	Ser	Asp	Ile	Trp	Asn	Ala	Thr	Lys	Tyr	Ala	Asn	Ser
50						55					60				
Cys	Cys	Gln	Asn	Ile	Gly	Gln	Ser	Phe	Pro	Gly	Phe	His	Gly	Ser	Glu
65					70					75					80
Met	Trp	Asn	Pro	Asn	Thr	Asp	Leu	Ser	Glu	Asp	Cys	Leu	Tyr	Leu	Asn
				85					90					95	
Val	Trp	Ile	Pro	Ala	Pro	Lys	Pro	Lys	Asn	Ala	Thr	Val	Leu	Ile	Trp
			100						105				110		
Ile	Tyr	Gly	Gly	Gly	Phe	Gln	Thr	Gly	Thr	Ser	Ser	Leu	His	Val	Tyr
		115					120					125			
Asp	Gly	Lys	Phe	Leu	Ala	Arg	Val	Glu	Arg	Val	Ile	Val	Val	Ser	Met
	130					135					140				
Asn	Tyr	Arg	Val	Gly	Ala	Leu	Gly	Phe	Leu	Ala	Leu	Pro	Gly	Asn	Pro
145					150					155					160
Glu	Ala	Pro	Gly	Asn	Met	Gly	Leu	Phe	Asp	Gln	Gln	Leu	Ala	Leu	Gln
				165					170					175	
Trp	Val	Gln	Lys	Asn	Ile	Ala	Ala	Phe	Gly	Gly	Asn	Pro	Lys	Ser	Val
			180					185					190		
Thr	Leu	Phe	Gly	Glu	Ser	Ala	Gly	Ala	Ala	Ser	Val	Ser	Leu	His	Leu
	195						200					205			
Leu	Ser	Pro	Gly	Ser	His	Ser	Leu	Phe	Thr	Arg	Ala	Ile	Leu	Gln	Ser
	210					215					220				
Gly	Ser	Phe	Asn	Ala	Pro	Trp	Ala	Val	Thr	Ser	Leu	Tyr	Glu	Ala	Arg
225					230					235					240
Asn	Arg	Thr	Leu	Asn	Leu	Ala	Lys	Leu	Thr	Gly	Cys	Ser	Arg	Glu	Asn
				245					250					255	
Glu	Thr	Glu	Ile	Ile	Lys	Cys	Leu	Arg	Asn	Lys	Asp	Pro	Gln	Glu	Ile
			260					265					270		
Leu	Leu	Asn	Glu	Ala	Phe	Val	Val	Pro	Tyr	Gly	Thr	Pro	Leu	Ser	Val
		275					280					285			
Asn	Phe	Gly	Pro	Thr	Val	Asp	Gly	Asp	Phe	Leu	Thr	Asp	Met	Pro	Asp
	290					295					300				
Ile	Leu	Leu	Glu	Leu	Gly	Gln	Phe	Lys	Lys	Thr	Gln	Ile	Leu	Val	Gly
305					310					315					320
Val	Asn	Lys	Asp	Glu	Gly	Thr	Ala	Phe	Leu	Val	Tyr	Gly	Ala	Pro	Gly
				325					330					335	
Phe	Ser	Lys	Asp	Asn	Asn	Ser	Ile	Ile	Thr	Arg	Lys	Glu	Phe	Gln	Glu
			340					345					350		
Gly	Leu	Lys	Ile	Phe	Phe	Pro	Gly	Val	Ser	Glu	Phe	Gly	Lys	Glu	Ser
		355					360					365			
Ile	Leu	Phe	His	Tyr	Thr	Asp	Trp	Val	Asp	Asp	Gln	Arg	Pro	Glu	Asn
	370					375					380				
Tyr	Arg	Glu	Ala	Leu	Gly	Asp	Val	Val	Gly	Asp	Tyr	Asn	Phe	Ile	Cys
385					390					395					400
Pro	Ala	Leu	Glu	Phe	Thr	Lys	Lys	Phe	Ser	Glu	Trp	Gly	Asn	Asn	Ala
				405					410					415	
Phe	Phe	Tyr	Tyr	Phe	Glu	His	Arg	Ser	Ser	Lys	Leu	Pro	Trp	Pro	Glu
			420					425					430		
Trp	Met	Gly	Val	Met	His	Gly	Tyr	Glu	Ile	Glu	Phe	Val	Phe	Gly	Leu
		435					440					445			
Pro	Leu	Glu	Arg	Arg	Asp	Asn	Tyr	Thr	Lys	Ala	Glu	Glu	Ile	Leu	Ser
	450					455					460				
Arg	Ser	Ile	Val	Lys	Arg	Trp	Ala	Asn	Phe	Ala	Lys	Tyr	Gly	Asn	Pro

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465					470					475				480
Asn	Glu	Thr	Gln	Asn	Asn	Ser	Thr	Ser	Trp	Pro	Val	Phe	Lys	Ser Thr
				485					490				495	
Glu	Gln	Lys	Tyr	Leu	Thr	Leu	Asn	Thr	Glu	Ser	Thr	Arg	Ile	Met Thr
			500					505				510		
Lys	Leu	Arg	Ala	Gln	Gln	Cys	Arg	Phe	Trp	Thr	Ser	Phe	Phe	Pro Lys
		515					520					525		
Val	Leu	Glu	Met	Thr	Gly	Asn	Ile	Asp	Glu	Ala	Glu	Trp	Glu	Trp Lys
	530					535					540			
Ala	Gly	Phe	His	Arg	Trp	Asn	Asn	Tyr	Met	Met	Asp	Trp	Lys	Asn Gln
545					550				555					560
Phe	Asn	Asp	Tyr	Thr	Ser	Lys	Lys	Glu	Ser	Cys	Val	Gly	Leu	
				565					570					

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 <213> Homo sapiens

<400> 19

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			20					25					30		
Tyr	Ala	Gln	Pro	Pro	Leu	Gly	Arg	Leu	Arg	Phe	Lys	Lys	Pro	Gln	Ser
		35					40					45			
Leu	Thr	Lys	Trp	Ser	Asp	Ile	Trp	Asn	Ala	Thr	Lys	Tyr	Ala	Asn	Ser
	50					55					60				
Cys	Cys	Gln	Asn	Ile	Asp	Gln	Ser	Phe	Pro	Gly	Phe	His	Gly	Ser	Glu
65					70					75					80
Met	Trp	Asn	Pro	Asn	Thr	Asp	Leu	Ser	Glu	Asp	Cys	Leu	Tyr	Leu	Asn
			85						90					95	
Val	Trp	Ile	Pro	Ala	Pro	Lys	Pro	Lys	Asn	Ala	Thr	Val	Leu	Ile	Trp
			100					105					110		
Ile	Tyr	Gly	Gly	Gly	Phe	Gln	Thr	Gly	Thr	Ser	Ser	Leu	His	Val	Tyr
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Asp	Gly	Lys	Phe	Leu	Ala	Arg	Val	Glu	Arg	Val	Ile	Val	Val	Ser	Met
	130					135					140				
Asn	Tyr	Arg	Val	Gly	Ala	Leu	Gly	Phe	Leu	Ala	Leu	Pro	Gly	Asn	Pro
145					150					155					160
Glu	Ala	Pro	Gly	Asn	Met	Gly	Leu	Phe	Asp	Gln	Gln	Leu	Ala	Leu	Gln
			165						170					175	
Trp	Val	Gln	Lys	Asn	Ile	Ala	Ala	Phe	Gly	Gly	Asn	Pro	Lys	Ser	Val
			180					185					190		
Thr	Leu	Phe	Gly	Glu	Ser	Ala	Gly	Ala	Ala	Ser	Val	Ser	Leu	His	Leu
		195					200					205			
Leu	Ser	Pro	Gly	Ser	His	Ser	Leu	Phe	Thr	Arg	Ala	Ile	Leu	Gln	Ser
	210					215					220				
Gly	Ser	Phe	Asn	Ala	Pro	Trp	Ala	Val	Thr	Ser	Leu	Tyr	Glu	Ala	Arg
225					230					235					240
Asn	Arg	Thr	Leu	Asn	Leu	Ala	Lys	Leu	Thr	Gly	Cys	Ser	Arg	Glu	Asn
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<213> Homo sapiens
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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser

		35					40					45				
Leu	Thr	Lys	Trp	Ser	Asp	Ile	Trp	Asn	Ala	Thr	Lys	Tyr	Ala	Asn	Ser	
	50					55					60					
Cys	Cys	Gln	Asn	Ile	Asp	Gln	Ser	Phe	Pro	Gly	Phe	His	Gly	Ser	Glu	
65					70					75					80	
Met	Trp	Asn	Pro	Asn	Thr	Asp	Leu	Ser	Glu	Asp	Cys	Leu	Tyr	Leu	Asn	
				85					90					95		
Val	Trp	Ile	Pro	Ala	Pro	Lys	Pro	Lys	Asn	Ala	Thr	Val	Leu	Ile	Trp	
			100						105				110			
Ile	Tyr	Gly	Gly	Gly	Phe	Gln	Thr	Gly	Thr	Ser	Ser	Leu	His	Val	Tyr	
		115							120				125			
Asp	Gly	Lys	Phe	Leu	Ala	Arg	Val	Glu	Arg	Val	Ile	Val	Val	Ser	Met	
	130					135					140					
Asn	Tyr	Arg	Val	Gly	Ala	Leu	Gly	Phe	Leu	Ala	Leu	Pro	Gly	Asn	Pro	
145					150					155					160	
Glu	Ala	Pro	Gly	Asn	Met	Gly	Leu	Phe	Asp	Gln	Gln	Leu	Ala	Leu	Gln	
				165					170					175		
Trp	Val	Gln	Lys	Asn	Ile	Ala	Ala	Phe	Gly	Gly	Asn	Pro	Lys	Ser	Val	
			180						185				190			
Thr	Leu	Phe	Gly	Glu	Ser	Ala	Gly	Ala	Ala	Ser	Val	Ser	Leu	His	Leu	
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Leu	Ser	Pro	Gly	Ser	His	Ser	Leu	Phe	Thr	Arg	Ala	Ile	Leu	Gln	Ser	
	210					215					220					
Gly	Ser	Phe	Asn	Ala	Pro	Trp	Ala	Val	Thr	Ser	Leu	Tyr	Glu	Ala	Arg	
225					230					235					240	
Asn	Arg	Thr	Leu	Asn	Leu	Ala	Lys	Leu	Thr	Gly	Cys	Ser	Arg	Glu	Asn	
				245					250					255		
Glu	Thr	Glu	Ile	Ile	Lys	Cys	Leu	Arg	Asn	Lys	Asp	Pro	Gln	Glu	Ile	
			260						265				270			
Leu	Leu	Asn	Glu	Ala	Phe	Val	Val	Pro	Tyr	Gly	Thr	Pro	Leu	Ser	Val	
		275					280					285				
Asn	Phe	Gly	Pro	Thr	Val	Asp	Gly	Asp	Phe	Leu	Thr	Asp	Met	Pro	Asp	
	290					295					300					
Ile	Leu	Leu	Glu	Leu	Gly	Gln	Phe	Lys	Lys	Thr	Gln	Ile	Leu	Val	Gly	
305					310					315					320	
Val	Asn	Lys	Asp	Glu	Gly	Thr	Ala	Phe	Leu	Val	Tyr	Gly	Ala	Pro	Gly	
				325					330					335		
Phe	Ser	Lys	Asp	Asn	Asn	Ser	Ile	Ile	Thr	Arg	Lys	Glu	Phe	Gln	Glu	
			340						345				350			
Gly	Leu	Lys	Ile	Phe	Phe	Pro	Gly	Val	Ser	Glu	Phe	Gly	Lys	Glu	Ser	
		355					360					365				
Ile	Leu	Phe	His	Tyr	Thr	Asp	Trp	Val	Asp	Asp	Gln	Arg	Pro	Glu	Asn	
	370					375					380					
Tyr	Arg	Glu	Ala	Leu	Gly	Asp	Val	Val	Gly	Asp	Tyr	Asn	Phe	Ile	Cys	
385					390					395						

**SECRET**

Arg	Ser	Ile	Val	Lys	Arg	Trp	Ala	Asn	Phe	Ala	Lys	Tyr	Gly	Asn	Pro
465					470					475					480
Asn	Glu	Thr	Gln	Asn	Asn	Ser	Thr	Ser	Trp	Pro	Val	Phe	Lys	Ser	Thr
				485					490						495
Glu	Gln	Lys	Tyr	Leu	Thr	Leu	Asn	Thr	Glu	Ser	Thr	Arg	Ile	Met	Thr
				500				505					510		
Lys	Leu	Arg	Ala	Gln	Gln	Cys	Arg	Phe	Trp	Thr	Ser	Phe	Phe	Pro	Lys
				515			520					525			
Val	Leu	Glu	Met	Thr	Gly	Asn	Ile	Asp	Glu	Thr	Glu	Trp	Glu	Trp	Lys
				530		535					540				
Ala	Gly	Phe	His	Arg	Trp	Asn	Asn	Tyr	Met	Met	Asp	Trp	Lys	Asn	Gln
545					550					555					560
Phe	Asn	Asp	Tyr	Thr	Ser	Lys	Lys	Glu	Ser	Cys	Val	Gly	Leu		
				565					570						

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 <211> 574  
 <212> PRT  
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Tyr	Ala	Gln	Pro	Pro	Leu	Gly	Arg	Leu	Arg	Phe	Lys	Lys	Pro	Gln	Ser
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Cys	Tyr	Gln	Asn	Thr	Asp	Gln	Ser	Phe	Pro	Gly	Phe	Leu	Gly	Ser	Glu
65					70					75					80
Met	Trp	Asn	Pro	Asn	Thr	Glu	Leu	Ser	Glu	Asp	Cys	Leu	Tyr	Leu	Asn
				85					90					95	
Val	Trp	Ile	Pro	Ala	Pro	Lys	Pro	Lys	Asn	Ala	Thr	Val	Met	Ile	Trp
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Ile	Tyr	Gly	Gly	Gly	Phe	Gln	Thr	Gly	Thr	Ser	Ser	Leu	Pro	Val	Tyr
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Asp	Gly	Lys	Phe	Leu	Ala	Arg	Val	Glu	Arg	Val	Ile	Val	Val	Ser	Met
		130				135					140				
Asn	Tyr	Arg	Val	Gly	Ala	Leu	Gly	Phe	Leu	Ala	Leu	Ser	Glu	Asn	Pro
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Glu	Ala	Pro	Gly	Asn	Met	Gly	Leu	Phe	Asp	Gln	Gln	Leu	Ala	Leu	Gln
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Trp	Val	Gln	Lys	Asn	Ile	Ala	Ala	Phe	Gly	Gly	Asn	Pro	Arg	Ser	Val
				180				185					190		
Thr	Leu	Phe	Gly	Glu	Ser	Ala	Gly	Ala	Ala	Ser	Val	Ser	Leu	His	Leu
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Gly	Ser	Ser	Asn	Ala	Pro	Trp	Ala	Val	Thr	Ser	Leu	Tyr	Glu	Ala	Arg
225					230					235					240
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<212> PRT
<213> Felis catus
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Leu	Thr	Lys	Trp	Ser	Asp	Ile	Trp	Asn	Ala	Thr	Lys	Tyr	Ala	Asn	Ser
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Met	Trp	Asn	Pro	Asn	Thr	Asp	Leu	Ser	Glu	Asp	Cys	Leu	Tyr	Leu	Asn
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Val	Trp	Ile	Pro	Thr	Pro	Lys	Pro	Lys	Asn	Ala	Thr	Val	Met	Ile	Trp
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Asp	Gly	Lys	Phe	Leu	Ala	Arg	Val	Glu	Arg	Val	Ile	Val	Val	Ser	Met
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Glu	Val	Pro	Gly	Asn	Met	Gly	Leu	Phe	Asp	Gln	Gln	Leu	Ala	Leu	Gln
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Trp	Val	Gln	Lys	Asn	Ile	Ala	Ala	Phe	Gly	Gly	Asn	Pro	Lys	Ser	Val
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Thr	Leu	Phe	Gly	Glu	Ser	Ala	Gly	Ala	Gly	Ser	Val	Ser	Leu	His	Leu
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Leu	Ser	Pro	Arg	Ser	Gln	Pro	Leu	Phe	Thr	Arg	Ala	Ile	Leu	Gln	Ser
	210					215					220				
Gly	Ser	Ser	Asn	Ala	Pro	Trp	Ala	Val	Met	Ser	Leu	Asp	Glu	Ala	Lys
225					230					235					240
Asn	Arg	Thr	Leu	Thr	Leu	Ala	Lys	Phe	Ile	Gly	Cys	Ser	Lys	Glu	Asn
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Asp	Thr	Glu	Ile	Lys	Cys	Leu	Arg	Asn	Lys	Asp	Pro	Gln	Glu	Ile	
		260					265					270			
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Thr	Leu	Leu	Gln	Leu	Gly	Gln	Phe	Lys	Lys	Thr	Gln	Ile	Leu	Val	Gly
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Val	Asn	Lys	Asp	Glu	Gly	Thr	Ala	Phe	Leu	Val	Tyr	Gly	Ala	Pro	Gly
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Phe	Ser	Lys	Asp	Asn	Asp	Ser	Ile	Ile	Thr	Arg	Lys	Glu	Phe	Gln	Glu
			340					345					350		
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Ile	Leu	Phe	Tyr	Tyr	Val	Asp	Leu	Leu	Asp	Asp	Gln	Arg	Ala	Glu	Lys
	370					375					380				
Tyr	Arg	Glu	Ala	Leu	Asp	Asp	Val	Leu	Gly	Asp	Tyr	Asn	Ile	Ile	Cys
385					390					395					400
Pro	Ala	Leu	Glu	Phe	Thr	Thr	Lys	Phe	Ser	Glu	Leu	Gly	Asn	Asn	Ala
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		420						425					430		
Trp	Met	Gly	Val	Met	His	Gly	Tyr	Glu	Ile	Glu	Phe	Val	Phe	Gly	Leu
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Tyr	Ala	Gln	Pro	Pro	Leu	Gly	Ser 40	Leu	Arg	Phe	Lys	Lys 45	Pro	Gln	Pro	
Leu	Asn 50	Lys	Trp	Pro	Asp	Val 55	Tyr	Asn	Ala	Thr	Lys 60	Tyr	Ala	Asn	Ser	
Cys 65	Tyr	Gln	Asn	Ile	Asp 70	Gln	Ala	Phe	Pro	Gly 75	Phe	Gln	Gly	Ser 80	Glu	
Met	Trp	Asn	Pro	Asn 85	Thr	Asn	Leu	Ser 90	Glu	Asp	Cys	Leu	Tyr 95	Leu	Asn	
Val	Trp	Ile	Pro 100	Val	Pro	Lys	Pro	Lys 105	Asn	Ala	Thr	Val 110	Met	Val	Trp	
Val	Tyr	Gly 115	Gly	Gly	Phe	Gln	Thr 120	Gly	Thr	Ser	Ser	Leu 125	Pro	Val	Tyr	
Asp	Gly 130	Lys	Phe	Leu	Thr	Arg 135	Val	Glu	Arg	Val	Ile 140	Val	Val	Ser	Met	
Asn 145	Tyr	Arg	Val	Gly 150	Ala	Leu	Gly	Phe	Leu	Ala 155	Phe	Pro	Gly	Asn 160	Ser	
Glu	Ala	Pro	Gly	Asn 165	Met	Gly	Leu	Phe	Asp 170	Gln	Gln	Leu	Ala 175	Leu	Gln	
Trp	Ile	Gln	Arg 180	Asn	Ile	Ala	Ala	Phe 185	Gly	Gly	Asn	Pro 190	Lys	Ser	Val	
Thr	Leu	Phe 195	Gly	Glu	Ser	Ala 200	Gly	Ala	Ala	Ser	Val 205	Ser	Leu	His	Leu	
Leu	Cys 210	Pro	Gln	Ser	Tyr	Pro 215	Leu	Phe	Thr	Arg	Ala 220	Ile	Leu	Glu	Ser	
Gly 225	Ser	Ser	Asn	Ala 230	Pro	Trp	Ala	Val	Lys	His 235	Pro	Glu	Glu	Ala 240	Arg	



Asn	Arg	Thr	Leu	Thr	Leu	Ala	Lys	Phe	Ile	Gly	Cys	Ser	Lys	Glu	Asn
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Glu	Lys	Glu	Ile	Thr	Cys	Leu	Arg	Ser	Lys	Asp	Pro	Gln	Glu	Ile	
		260				265					270				
Leu	Leu	Asn	Glu	Lys	Leu	Val	Leu	Pro	Ser	Asp	Ser	Ile	Arg	Ser	Ile
		275				280					285				
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	290					295					300				
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Val	Asn	Lys	Asp	Glu	Gly	Thr	Ala	Phe	Leu	Val	Tyr	Gly	Ala	Pro	Gly
			325						330					335	
Phe	Ser	Lys	Asp	Asn	Asp	Ser	Leu	Ile	Thr	Arg	Arg	Glu	Phe	Gln	Glu
			340					345				350			
Gly	Leu	Asn	Met	Tyr	Phe	Pro	Gly	Val	Ser	Ser	Leu	Gly	Lys	Glu	Ala
		355					360				365				
Ile	Leu	Phe	Tyr	Tyr	Val	Asp	Trp	Leu	Gly	Asp	Gln	Thr	Pro	Glu	Val
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Tyr	Arg	Glu	Ala	Phe	Asp	Asp	Ile	Ile	Gly	Asp	Tyr	Asn	Ile	Ile	Cys
385					390					395					400
Pro	Ala	Leu	Glu	Phe	Thr	Lys	Lys	Phe	Ala	Glu	Leu	Glu	Ile	Asn	Ala
				405					410					415	
Phe	Phe	Tyr	Tyr	Phe	Glu	His	Arg	Ser	Ser	Lys	Leu	Pro	Trp	Pro	Glu
		420						425				430			
Trp	Met	Gly	Val	Met	His	Gly	Tyr	Glu	Ile	Glu	Phe	Val	Phe	Gly	Leu
	435					440					445				
Pro	Leu	Glu	Arg	Arg	Val	Asn	Tyr	Thr	Arg	Ala	Glu	Glu	Ile	Phe	Ser
	450					455					460				
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465					470					475					480
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				485					490					495	
Glu	Gln	Lys	Tyr	Leu	Thr	Leu	Asn	Thr	Glu	Lys	Ser	Lys	Ile	Asn	Ser
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Lys	Leu	Arg	Ala	Pro	Gln	Cys	Gln	Phe	Trp	Arg	Leu	Phe	Phe	Pro	Lys
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Val	Leu	Glu	Ile	Thr	Gly	Asp	Ile	Asp	Glu	Arg	Glu	Gln	Glu	Trp	Lys
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Ala	Gly	Phe	His	Arg	Trp	Ser	Asn	Tyr	Met	Met	Asp	Trp	Lys	Asn	Gln
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